

PATENT  
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**AUTOMATED ZOOM CONTROL**

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## **AUTOMATED ZOOM CONTROL**

### **TECHNICAL FIELD**

The present invention relates generally to digital camera systems and methods.

### **BACKGROUND**

5       Conventional digital still cameras have zoom lenses and zoom control mechanisms. The main disadvantages of currently available digital still cameras is that these systems force the photographer to perform all of the tasks that he or she has always done using conventional non-digital cameras to prepare to take a photograph. It would be desirable to provide the photographer with more options regarding the means  
10       by which he or she captures images.

      A number of US patents uncovered in searching the USPTO patent database (1976 to present) discuss zoom priority. These include US Patent Nos. 5,113,210, 5,227,824, 5,231,437, 5,404,191 and 5,473,403. These patents do not appear to disclose or suggest anything regarding automated zoom control in the manner of the present  
15       invention.

### **SUMMARY OF THE INVENTION**

      The present invention provides for automated zoom control and/or automated wide angle capture control that are preferably implemented in digital camera systems.  
20       The essence of the present invention may best be described as burst mode with automated zoom/wide angle capture. Both digital cameras and control methods are disclosed.

In an exemplary automated zoom control embodiment, the camera is configured to have imaging apparatus that selectively couples images from an image scene to an image sensing apparatus that senses the coupled images. A processor implements an automated zoom control function that automatically records a plurality of closely related images having different zoom levels sensed by the image apparatus, and from which a user selects images for storage.

### BRIEF DESCRIPTION OF THE DRAWINGS

The various features and advantages of embodiments of the present invention may be more readily understood with reference to the following detailed description taken in conjunction with the accompanying drawings, wherein like reference numerals designate like structural elements, and in which:

Fig. 1 is a rear view of an exemplary embodiment of a digital video camera having automated zoom control in accordance with the principles of the present invention;

Fig. 2 is a front view of the exemplary digital camera;

Fig. 3 is a top view of the exemplary digital camera; and

Fig. 4 is a flow diagram illustrating exemplary automated zoom control in accordance with the principles of the present invention.

### DETAILED DESCRIPTION

Referring to the drawing figures, Figs. 1, 2 and 3 show rear, front and top views, respectively, of an exemplary embodiment of a digital video camera 10 or digital still camera 10 having automated zoom control 50 in accordance with the principles of the present invention.

As is shown in Figs. 1 and 2, the exemplary digital camera 10 comprises a handgrip section 20 and a body section 30. The handgrip section 20 includes a power button 21 having a lock latch 22, a shutter button 23, a strap connection 24, and a battery compartment 26 for housing batteries 27.

As is shown in Fig. 1, a rear surface 31 of the body section 30 comprises a liquid crystal display (LCD) 32 or viewfinder 32, a rear microphone 33, a joystick pad 34, a zoom control dial 35, a plurality of buttons 36 for setting functions of the camera 10 and an output port 37 for downloading images to a computer, for example.

As is shown in Fig. 2, a lens, 41, which may be a zoom lens 41, extends from a front surface 42 of the digital camera 10. A metering element 43 and front microphone 44 are disposed on the front surface 42 of the digital camera 10.

An image sensor 11 is coupled to processing circuitry 12 are housed within the body section 30. The processing circuitry 12 comprises a zoom control algorithm 13 that is used to implement the automated zoom control function of the digital camera 10. This will be discussed in more detail below.

5       The zoom function may be implemented using a mechanical zoom control 48 (generally designated) that moves certain optical elements of the zoom lens 41 to different physical positions. Alternatively, the zoom function may be implemented using digital zoom control (which may be performed using the processing circuitry 12 and zoom control algorithm 13) wherein pixels of a recorded image are "thrown out" or  
10       removed from the recorded image, and the image is scaled to its original size to create the illusion of zoom capture.

Fig. 3 is a flow diagram illustrating automated zoom control 50 in accordance with the principles of the present invention. The automated zoom control 50 implemented in accordance with the present invention can be described as burst mode  
15       with automated zoom capture. In the present method 50, a camera 10 is configured 50 as outlined above.

As the camera 10 zooms, several (a plurality of) images having different zoom levels are automatically recorded 52 upon assertion or depressing of the shutter button by a photographer, which amounts to burst mode image capture. The photographer thus  
20       captures a series of very closely related images having different zoom levels. The zoom levels may be either predetermined, or in the case of digital zoom, may be determined at a later time (postdetermined). The photographer then selects 53 from the recorded images those image that he or she wishes to keep, and which are stored, archived or printed.

25       In the case of predetermination, the use of different zoom increments may control the position of the zoom lens 41 in any number of ways. The automated zoom capture feature involves "near priority" and "far priority" images, that creates an emphasis within the set of images that are captured closer or farther away, respectively. "Custom zoom priority" is a mode in which automated zoom capture settings are  
30       programmed by the photographer and later used during-image capture.

In terms of the user interface, the photographer would put the camera 10 in a programming mode by which the camera autodetects stops at different zoom positions (say for 1 second, for example). These zoom positions are then stored for later use when "custom zoom priority" is turned on. In the case of postdetermined zoom capture,  
35       pixels are "thrown out" or removed and the image is scaled to original size to create the illusion of zoom capture. It should be noted that zoom is used as a reference to the position of the zoom lens 41 or its optics.

The principles of the present invention can be equally applied to automated wide angle capture and a combination of zoom through wide angle capture. In these implementations, different wide angle settings are prestored, or both wide angle and zoom settings are prestored, for later use in a "custom wide angle/zoom priority" mode.

5 When "custom wide angle priority" is turned on, several images are automatically recorded 52 at different wide angle and/or wide angle and zoom settings, and similarly when "custom wide angle/zoom priority" is turned on.

Similar to shutter-priority and aperture priority, the present invention automates the foundation processes of image capture. Using the present invention, the  
10 photographer no longer needs to worry about image capture at all, but instead can be focused on the image of interest that is to be photographed. The present automated zoom feature, and the wide angle and wide angle/zoom features, provide the photographer with more options regarding the means by which he or she captures images.

15 Control of the camera is more automated using the present invention. The photographer can concentrate on the image and at a later time consider framing of the image. This also gives the photographer more variation for consideration of the perfect shot long after the pictures have been taken. Further, the present invention cuts down on postview editing (in the case of predetermined/optical auto zoom) because there will be  
20 more than one zoom shot of similar scenes, cropping is reduced. Also, because the photographer can set up beforehand, all zoom positions (or wide angle) can be carefully considered and automated so that when "the perfect sunset arrives" the photographer can simply watch. Alternatively, the photographer can concentrate on framing and hold the camera in a more stable manner than when required to use the zoom control at the  
25 same time.

Thus, an improved automated zoom control system for use in digital camera systems, and the like has been disclosed. It is to be understood that the above-described embodiment is merely illustrative of some of the many specific embodiments that represent applications of the principles of the present invention. Clearly, numerous and  
30 other arrangements can be readily devised by those skilled in the art without departing from the scope of the invention.